

## CLAIMS

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1. An image processing method characterized in that:  
data indicating a grayscale of a pixel is input;  
said input data is converted into grayscale data which specifies a grayscale of an image output apparatus according to predetermined characteristics; and

when said input data corresponds to a specific grayscale value which causes a defect in an output of said image output apparatus, the whole or at least part of said input data is converted into grayscale data which specifies a grayscale value other than the specific grayscale value, and the converted grayscale data is supplied to said image output apparatus.

2. An image processing method according to claim 1, characterized in that said conversion comprises color reduction processing for reducing the number of levels which is indicatable by said input data into the number of levels which is indicatable by said grayscale data.

3. An image processing method according to claim 2, characterized in that said color reduction processing is pseudo-halftone processing for distributing said grayscale data so that said grayscale data does not concentrate on the same value.

20 4. An image processing method according to claim 2, characterized in that said color reduction processing converts all the input data corresponding to said specific grayscale value into grayscale data which specifies one of grayscale values adjacent to said specific grayscale value.

25 5. An image processing method characterized by comprising:  
a step of inputting data which indicates a grayscale of a pixel; and

5 a step of converting said input data into grayscale data which specifies a grayscale of an image output apparatus by reducing the number of levels of said input data according to predetermined characteristics, and by performing pseudo-half-tone processing for displaying a half-tone, in which, when said input data corresponds to a specific grayscale value which causes a defect in an output of said image output apparatus, the whole or at least part of said input data is converted into grayscale data which specifies one of grayscale values adjacent to said specific grayscale value, and of supplying the converted data to said image output apparatus.

0 6. An image processing method according to claim 5, characterized in that said step of converting said input data into said grayscale data comprises:

a step of performing first pseudo-half-tone processing on said input data;

a step of determining whether the data subjected to said first pseudo-half-tone processing is said specific grayscale value; and

5 a step of outputting the data subjected to said first pseudo-half-tone processing as the grayscale data when a result of said determination step is no, and of further performing second pseudo-half-tone processing on the data subjected to said first pseudo-half-tone processing when a result of said determination step is yes so as to convert the data into the grayscale data which specifies one of the grayscale values adjacent to said specific grayscale value.

20 7. An image processing method according to claim 5, wherein said step of converting said input data into said grayscale data comprises:

a step of performing first pseudo-half-tone processing on said input data;

25 a step of determining whether the data subjected to said first pseudo-half-tone processing is said specific grayscale value and whether said input data is contained in part of a range corresponding to said specific grayscale value in said characteristics; and

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a step of outputting the data subjected to said first pseudo-half-tone processing as the grayscale data while allowing an output of said specific grayscale value when a result of said determination step is no, and of further performing second pseudo-half-tone processing on the data subjected to said first pseudo-half-tone processing when a result of said determination step is yes so as to convert the data into the grayscale data which specifies one of the grayscale values adjacent to said specific grayscale value.

8. An image processing method according to claim 5, characterized in that said step of converting said input data into said grayscale data comprises:

a step of determining whether said input data is contained in a range which is to be converted into said specific grayscale value after performing first pseudo-half-tone processing; and

a step of performing said first pseudo-half-tone processing on said input data when a result of said determination step is no so as to convert the data into the grayscale data, and of performing second pseudo-half-tone processing on said input data when a result of said determination step is yes so as to convert the data into the grayscale data which specifies one of the grayscale values adjacent to said specific grayscale value.

9. An image processing method according to claim 5, characterized in that said step of converting said input data into said grayscale data comprises:

a step of determining whether said input data is contained in part of a range which is to be converted into said specific grayscale value after performing first pseudo-half-tone processing; and

a step of performing said first pseudo-half-tone processing on said input data when a result of said determination step is no so as to output the data as the grayscale data while allowing an output of said specific grayscale value, and of performing second pseudo-half-tone processing on said input data when a result of said determination step is yes so as to convert the data into the grayscale data which specifies one of the grayscale values adjacent to said specific grayscale value.

10. An image processing method according to claim 5, characterized in that said step of converting said input data into said grayscale data comprises:

a step of converting said input data by according to the modified characteristics in such a manner that one of said characteristics out of the range corresponding to said special grayscale value remains the same, and the inclination of said range is substantially halved, and the other characteristic out of said range maintains the continuity;

a step of performing pseudo-half-tone processing on the data converted by the modified characteristics; and

a step of, among the data subjected to said pseudo-half-tone processing, outputting the data smaller than said special grayscale value as the grayscale data, and of shifting each grayscale value of the data greater than or equal to said special grayscale value.

11. An image processing method characterized in that:

data indicating a grayscale of a pixel is input;

a dither value according to coordinates of said pixel is selected from a predetermined dither matrix for pseudo-half-tone processing, and is added to said input data;

the data obtained by adding the dither value thereto is reduced to the number of levels which is indicatable by an image output apparatus;

it is determined whether the reduced data is a specific grayscale value which causes a defect in an output of said image output apparatus;

the reduced data is output as it is to said image output apparatus when a result of said determination is no; and

when a result of said determination is yes, said dither value and a value according to said color reduction are added to the reduced data so as to convert said input data into data which specifies one of

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grayscale values adjacent to said specific grayscale value according to the addition result and the resulting data is output to the image output apparatus.

12. An image processing method according to claim 11, characterized in that the result of said determination is rendered to be yes only when the reduced data is said specific grayscale value, and when the grayscale of said input data is contained in a range corresponding to said specific grayscale value and is contained in a range narrower than the range corresponding to said specific grayscale value.

13. An image processing method characterized in that:

data indicating a grayscale of a pixel is input;

it is determined whether said input data is contained in a range which is to be converted into a specific grayscale value which causes a defect in an output of an image output apparatus after a dither value is added to said input data, and after the number of levels of said input data is reduced to the number of levels which is indicatable by said image output apparatus;

when a result of said determination is no, the dither value is added to said input data, and the number of levels of said input data is reduced to the number of levels which is indicatable by said image output apparatus, and the resulting data is output to said image output apparatus; and

when a result of said determination is yes, a doubled value of said dither value and a value according to said color reduction are added to said input data so as to convert said input data into data which specifies one of grayscale values adjacent to said specific grayscale value according to the addition result, and the resulting data is output to said image output apparatus.

14. An image processing method according to claim 13, characterized in that the result of said determination is rendered to be yes only when said input data is contained in a range narrower than the range which is to be converted into the specific grayscale value which causes a defect in said image

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output apparatus.

15. An image processing method in which:

pre-processing is performed on input data indicating a grayscale of a pixel;

pseudo-half-tone processing is performed on the data subjected to said pre-processing; and

post-processing is performed on the data subjected to said pseudo-half-tone processing, thereby reducing the number of levels of said input data into the number of levels which is indicatable by an image output apparatus;

said image processing method being characterized in that: said pre-processing compresses a range from a center value corresponding to one of grayscale values adjacent to a specific grayscale value which causes a defect in an output of said image output apparatus to a center value corresponding to the other adjacent grayscale value into a range from the center value corresponding to one of the grayscale values adjacent to said specific grayscale value to a center value corresponding to said specific grayscale value; and

when the data subjected to said pseudo-half-tone processing is said specific grayscale value, said post-processing shifts the grayscale value and then outputs the shifted value.

16. An image processing method in which:

pre-processing is performed on input data indicating a grayscale of a pixel;

pseudo-half-tone processing is performed on the data subjected to said pre-processing; and

post-processing is performed on the data subjected to said pseudo-half-tone processing, thereby reducing the number of levels of said input data into the number of levels which is indicatable by an image output apparatus;

said image processing method being characterized in that: said pre-processing compresses a range from a center value corresponding to one of grayscale values adjacent to a specific grayscale

value which causes a defect in an output of said image output apparatus to a center value corresponding to the other adjacent grayscale value into a range from the center value corresponding to one of the grayscale values adjacent to said specific grayscale value to a center value corresponding to said specific grayscale value; and

when the grayscale value of said input data is contained in a range including the center value corresponding to said specific grayscale value, and when the data subjected to said pseudo-halftone processing is said specific grayscale value, said post-processing shifts the grayscale value and then outputs the shifted value.

17. An image processing method in which:

pre-processing is performed on input data indicating a grayscale of a pixel;

pseudo-halftone processing is performed on the data subjected to said pre-processing; and

post-processing is performed on the data subjected to said pseudo-halftone processing, thereby reducing the number of levels of said input data into the number of levels which is indicatable by an image output apparatus;

said image processing method being characterized in that: said pre-processing compresses a range including a center value corresponding to a specific grayscale value which causes a defect in an output of said image output apparatus into a range including the mean value of a center value corresponding to one of the grayscale values adjacent to said specific grayscale value and a center value corresponding to said specific grayscale value; and

when the grayscale value of said input data is contained in the range including the center value corresponding to said specific grayscale value, and when the data subjected to said pseudo-halftone processing is said specific grayscale value, said post-processing shifts the grayscale value and then outputs the shifted value.

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5 18. An image processing apparatus characterized by comprising a conversion circuit for converting data indicating a grayscale of a pixel into grayscale data which specifies a grayscale of an image output apparatus according to predetermined characteristics, wherein, when said input data corresponds to a specific grayscale value which causes a defect in an output of said image output apparatus, said conversion circuit converts the whole or at least part of said input data into grayscale data which specifies a grayscale value other than the specific grayscale value, and supplies the converted grayscale data to said image output apparatus.

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5 19. An image processing apparatus characterized by comprising a conversion circuit for converting data indicating a grayscale of a pixel into grayscale data which specifies a grayscale of an image output apparatus by reducing the number of levels of said input data according to predetermined characteristics, and by performing pseudo-half-tone processing for displaying a half-tone, wherein said conversion circuit converts the whole or at least part of the data corresponding to a specific grayscale value which causes a defect in an output of said image output apparatus into grayscale data which specifies one of grayscale values adjacent to said specific grayscale value, and supplies the converted data to said image output apparatus.

20. An electronic device comprising an image processing apparatus and an image output apparatus,

20 characterized in that said image processing apparatus converts data indicating a grayscale of a pixel into grayscale data which specifies a grayscale of said image output apparatus by reducing the number of levels of said input data according to predetermined characteristics and by performing pseudo-half-tone processing for displaying a half-tone, said image processing apparatus comprises a conversion circuit for converting the whole or at least part of the input data corresponding to a specific  
25 grayscale value which causes a defect in an output of said image output apparatus into the grayscale



data which specifies one of grayscale values adjacent to said specific grayscale value, and said image forming apparatus outputs an image according to the grayscale data converted by said image processing apparatus.

21. An image processing program which causes a computer for supplying grayscale data which specifies a grayscale of an image output apparatus to said image output apparatus to function as means for converting data indicating a grayscale of a pixel into said grayscale data by reducing the number of levels of the input data according to predetermined characteristics and by performing pseudo-half-tone processing for displaying a half-tone, wherein said means converts the whole or at least part of the data corresponding to a specific grayscale value which causes a defect in an output of said image output apparatus into the grayscale data which specifies one of grayscale values adjacent to said specific grayscale value, and supplies the converted grayscale data to said image output apparatus.

22. A computer-readable recording medium on which an image processing program is recorded, said image processing program causing a computer for supplying grayscale data which specifies a grayscale of an image output apparatus to said image output apparatus to function as means for converting data indicating a grayscale of a pixel into said grayscale data by reducing the number of levels of the input data according to predetermined characteristics and by performing pseudo-half-tone processing for displaying a half-tone, wherein said means converts the whole or at least part of the data corresponding to a specific grayscale value which causes a defect in an output of said image output apparatus into the grayscale data which specifies one of grayscale values adjacent to said specific grayscale value, and supplies the converted grayscale data to said image output apparatus.